

## Impact of West Nile Virus on California Birds

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The presence of dead American Crows has been the calling card of the West Nile virus (Family Flaviviridae, genus *Flavivirus*, WNV) invasion into North America. The especially high virulence of the invading and now circulating strains of WNV has been attributed to a mutation in the viral helicase gene (Braut et al. 2007). However, not all bird species responded equally to WNV, because of differences in susceptibility to infection, habitat selection, and mosquito host selection patterns. To better quantify the effects of WNV on the avifauna of California (CA) during the post-WNV invasion period (2004-2007), and in an attempt to identify species at greater risk of population decline due to WNV, four datasets were evaluated with respect to WNV-associated risk and combined to create a risk assessment for 23 CA bird species. The four datasets evaluated were: 1) the presence of antibodies against WNV in free-ranging birds, 2) percentage of dead birds tested and found WNV positive by the California dead bird program, 3) WNV-associated mortality determined from experimental WNV infections, and 4) population declines detected by Bayesian regression analyzed data from 1980-2003 (pre-WNV) to extrapolate population trends for the 2004-2007 post-WNV period (LaDeau et al. 2007). Declines in the BBS data were considered significant if they dropped below 95% confidence intervals (CI) generated by the model. Since the model was based on pre-WNV population trends, significant declines from the expected 95% CI, in areas of epizootic WNV transmission, were attributed to the negative impact of WNV. Risk was assessed and scored

for each of the four data sets and then averaged into an overall risk score (Table 1). This risk score allowed for species to be compared based on WNV-associated risk. Scores ranged from 1.00 for the Pigeon (*Columba livia*) through 3.40 for Yellow-billed Magpies (*Pica nuttalli*) and 3.60 for American Crows (*Corvus brachyrhynchos*). Other species potentially at high risk for WNV included the House Finch (*Caprodacus mexicanus*), Black-crowned Night Heron (*Nycticorax nycticorax*), Yellow Warbler (*Dendroica petechia*) and Western Scrub-Jay (*Aphelocoma coerulescens*). Significant population declines in competent host species may alter avian community structure, allow for the increase in highly efficient competing species such as House Sparrows (*Passer domesticus*), and alter the dynamics of WNV transmission by changing host availability for host-seeking mosquitoes.

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Table 1: Overall WNV-associated risk score for 23 species of California birds. Risk was assessed based on four indicators: wild bird serology from Kern, Coachella and Yolo Counties, the percent of each species that tested positive from the CA dead bird program, the outcome of experimental infection studies, and bird population declines that fell below 95% confidence intervals generated by our BBS regression model. The overall risk score is an average of each of the four indicators; the BBS model was given a double weight because it reflected actual change in bird populations.

